

SURFACE AREAS OF COMBINED SOLIDS

(Surface Areas & Volumes)

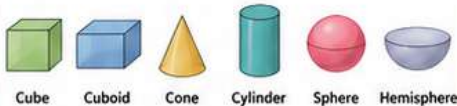


1. CHAPTER SNAPSHOT

A combined solid is formed by joining two or more basic solids.

We add only the **exposed** surfaces and **ignore the common (hidden)** surfaces.

BASIC SOLIDS



2. HIGH-YIELD CONCEPTS

- 1 Identify all the solids in the object.
- 2 Draw a rough sketch and label the dimensions.
- 3 Find the common (joining) surfaces.
- 4 Ignore the common (hidden) surfaces.
- 5 Add only the required (exposed) surface areas.

★ GOLDEN RULE ★

Surface Area of Combined Solid =
Sum of Exposed Surfaces – Common Surfaces

3. COMPLETE FORMULA BOOK

Solid	Total Surface Area (TSA) (in square units)	Curved/Lateral Surface Area (CSA/LSA) (in square units)	Where
Cube	$6a^2$	$4a^2$	a – side
Cuboid	$2(lb + bh + hl)$	$2h(l + b)$	l – length b – breadth h – height
Cone	$\pi r(l + r)$	πrl	r – radius l – slant height $l = \sqrt{r^2 + h^2}$ h – height
Cylinder	$2\pi r(h + r)$	$2\pi rh$	r – radius h – height
Sphere	$4\pi r^2$	$4\pi r^2$	r – radius
Hemisphere	$3\pi r^2$	$2\pi r^2$	r – radius

4. BOARD EXAM FOCUS (HOTSPOTS)



Circus Tent

(Cone + Cylinder)

- Only outer surface is covered.
- Use: CSA of cone + CSA of cylinder (Do not add the common circular base.)



Capsule

(Cylinder + 2 Hemispheres)

TSA = CSA of cylinder + CSA of two hemispheres

$$TSA = 2\pi rh + 4\pi r^2$$



Ice Cream

(Cone + Hemisphere)

TSA = CSA of cone + CSA of hemisphere



Water Tank

(Cylinder + Hemisphere)

TSA = CSA of cylinder + CSA of hemisphere



Toy / Model

Combinations like: Cone + Hemisphere,
Cylinder + Cone, Cylinder + Hemisphere.

Competency Focus

- ✓ Which surfaces are exposed?
- ✓ Which surfaces are hidden/common?
- ✓ Why are common surfaces ignored?
- ✓ Choose the correct formula and apply.

5. EXAMPLE HOTSPOTS (TYPICAL Qs)

- 1 A circus tent is in the shape of a cone of radius r and slant height l mounted on a cylindrical base of height h and radius r . Find the total area of canvas required to make the tent.
- 2 A capsule is in the shape of a cylinder of height h and radius r with two hemispherical ends. Find its total surface area.
- 3 An ice-cream is in the shape of a cone of radius r and height h placed on a hemisphere of radius r . Find its total surface area.
- 4 A water tank consists of a cylinder of radius r and height h and a hemisphere of radius r mounted on the top. Find the total surface area.

PYQ/Board Hotspots

- Diagram based combined solids
- Decide what to include and exclude
- Real-life objects
- Application + expression based questions

6. SMART REVISION

- ★ Rule 1: Always count only outer (exposed) surfaces. ✓
- ★ Rule 2: Common joining surfaces are never counted. ✗
- ★ Rule 3: For cone, use slant height
 $l = \sqrt{r^2 + h^2}$
- ★ Rule 4: For sphere → CSA = TSA.
- ★ Rule 5: For hemisphere → CSA ≠ TSA.
- ★ Rule 6: Write units (cm^2 , m^2) in the final answer. cm^2

7. COMMON MISTAKES

- ✗ Using TSA of each solid and adding directly.
- ✗ Counting the common (hidden) surfaces.
- ✗ Including the circular base of cone in circus tent.
- ✗ Using diameter instead of radius.
- ✗ Forgetting slant height of cone.
- ✗ Mixing CSA and TSA.
- ✗ Wrong value of π or wrong unit.



8. VISUAL MEMORY AID – COUNT, REMOVE, ADD

(A) CIRCUS TENT (Cone + Cylinder)

- 1 Whole object
- 2 Separate solids
- 3 Common base (hidden)
- 4 Remove common base
- 5 Exposed surfaces (CSA only)

$TSA = \pi rl + 2\pi rh$

(B) CAPSULE (Cylinder + 2 Hemispheres)

- 1 Whole object
- 2 Separate solids
- 3 Common faces (hidden)
- 4 Remove common faces
- 5 Exposed surfaces (CSA only)

$TSA = 2\pi rh + 4\pi r^2$

(C) WATER TANK (Cylinder + Hemisphere)

- 1 Whole object
- 2 Separate solids
- 3 Common circle (hidden)
- 4 Remove common circle
- 5 Exposed surfaces (CSA only)

$TSA = 2\pi rh + 2\pi r^2$

UNIVERSAL RULE



9. DIFFERENCE BETWEEN CSA & TSA (QUICK VISUAL)

CYLINDER	CONE	HEMISPHERE
 $CSA = 2\pi rh$ (Only curved side)	 $CSA = \pi rl$ (Only curved part)	 $CSA = 2\pi r^2$ (Curved dome)
$TSA = 2\pi r(h + r)$ (Curved side + 2 circular bases)	$TSA = \pi r(l + r)$ (Curved part + circular base)	$TSA = 3\pi r^2$ (Curved dome + circular base)

10. RAPID REVISION (30 SECONDS)

- Cube = $6a^2$
 - Cuboid = $2(lb + bh + hl)$
 - Cone = $\pi r(l + r)$
 - Cylinder = $2\pi r(h + r)$
 - Sphere = $4\pi r^2$
 - Hemisphere = $3\pi r^2$
- ✓ Ignore common surfaces
 - ✓ Add only exposed surfaces
 - ✓ Use correct formula (CSA/TSA)
 - ✓ Write units (cm^2 , m^2)
 - ✓ Check calculations

11. KEY TAKEAWAY

For any combined solid problem:
Identify the solids → Remove the common surfaces → Apply correct CSA/TSA formulas → Add only the exposed surfaces → Write the answer with square units.

PRACTICE • THINK • SCORE!

